

## Effects of the Venus Atmosphere on the Behavior of Thermal Insulating Materials

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### **Abstract**

A Venus Lander thermal control system is critical to mission success because the extremely high temperature and pressure environment presents significant thermal challenges to operating lifetime. Future Venus surface missions will require advanced thermal control strategies to allow greater science return than previous missions by operating for several hours in Venus' harsh environment. This paper describes the effects of a simulated Venus atmosphere on the thermal conductivity of insulation materials that would be placed external to the pressure vessel. The candidate insulation systems include porous silica materials and aerogel formulations capable of handling a high temperature and high pressure gas environment while maintaining low thermal conductivity. Thermal conductivity data were measured at 470°C and 1 bar pressure in air and at 92 bar pressure in carbon dioxide for several insulation materials. On average the thermal conductivity was observed to increase 5 to 8 times in the Venus-like environment over the Earth environment. This has a number of implications on the design and testing of the thermal system for a Venus Lander.

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